

# PATENT ABSTRACTS OF JAPAN

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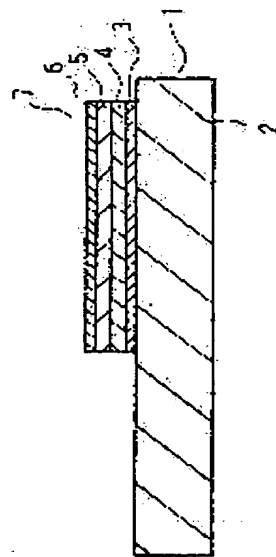
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HAMADA NOBUHIRO

## (54) CARD AND IMAGE FORMING METHOD

### (57)Abstract:

**PURPOSE:** To obtain a card capable of setting the discrimination data original to a publisher and capable of being discriminated visually and having high forgery preventing effect by providing a display part wherein a metal reflecting layer, a polymer liquid crystal layer and a polarizing film layer are successively laminated to the single surface or both surfaces of the card.

**CONSTITUTION:** A metal reflecting layer 3, a polymer liquid crystal layer 4 and a polarizing film 5 are successively laminated to a card base material 2 and, if necessary, a protective layer 6 may be formed to the polarizing layer 5. The metal reflecting layer 3 is formed from a vapor deposition film or sputtering film composed of a metal or alloy having reflectivity. The polymer liquid crystal layer has an m.p. of about 80-200°C and pref. shows thermotropic properties and, for example, there is a thermotropic polymer material such as a polyester copolymer. As the polarizing film, a PVA-iodine type film and a dichromatic dye type film are used.



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⑮ 発明の名称 カード及び画像形成方法

⑯ 特 願 平1-255745

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明 細 書

1. 発明の名称

カード及び画像形成方法

2. 特許請求の範囲

(1) カードの片面もしくは両面に、金属反射層、高分子液晶層、偏光フィルム層を順次積層してなる表示部を有することを特徴とするカード。

(2) カード上に金属反射層、高分子液晶層、偏光フィルム層を順次積層し形成せしめた表示部に対して、前記偏光フィルム層上から任意の文字・絵柄等の画像パターン状に一定方向に加熱・加圧印字

最近、磁気カードを中心とし、F、調行カード、IRカード、等に見られるようにカードが広になってきており、カード利用するものも出てきている。この造、変造、改竄、不正利用とする手段として様々なセキュリティ、実用にされている。

例えば、悪用防止手段として、情報を保持させるもので、目視不可視情報、目視可能である、改竄を困難とする可視情報が、は磁気記録層を多層化する方

、気記憶層にウオーターマークを設ける方法などにより識別情報をカード上に設けることにより、カードの悪用を防止してきた。

# <発明が解決しようとする課題>

しかしながら、非可視情報を設ける場合には製造の複雑化、識別情報の判別に専用の装置を必要とし、現行のシステムに変更を加えなければならないという問題を有する。また、可視情報は判別のための特別な装置は必要としないが、カード一枚毎に情報を変更することは難しく、微細・精密印刷、光印刷による特殊印刷はコストと偽造防止の効果に問題があり、プログラムはコストに問題がある。

即ち、カードを発行する上でかかるコストが最も問題とされる比較的少量発行の場合、簡単に識別でき、しかも特別な装置を必要としない効果的な偽造防止方法が求められていた。

そこで本発明は上記の問題点を解決すべくなされたもので、カードに発行者独自の識別情報を設定できるとともに、肉眼による判別が可能な、偽

った白色偏光光が部分的に分子配向に異方性を示した高分子液晶層を透過し、楕円偏光に変わり、金属反射層により反射され、再度偏光フィルムを透過して透過反射光が得られる。この透過反射光は波長によって光の強さが異なるため、多彩な色相を有する画像が得られ、また配向方向と分子配向された高分子液晶層との角度により視覚的に異なった色相の画像が得られる。

# <実施例>

以下、本発明を図面の実施例に基づいて詳細に説明する。

第1図は本発明によるカードの部分拡大断面図である。このカードは、図1に示すように、金属反射層(1)

造防止効果の高いカードを製造する。

# <課題を解決するための手段>

上記目的を達成するために、

- 1) カードの片面もしくは両面に、高分子液晶層、偏光フィルム層を有するカードであり、
- 2) カード上に金属反射層、偏光フィルム層を順次積層し形成して、偏光偏光フィルム層上に、楕円偏光の画像パターン状に一定の文字し、前記高分子液晶層を配向部に画像を形成する画像形成部を有する。

本発明では、カード上に金属反射層、偏光フィルム層を順次積層するため、偏光フィルム上に、加圧印字することにより、高分子液晶層に分子配向させ、任意の画像となり、また偏光フィルムを

があるが、上記に挙げたものではない。

金属反射層(1)は反射性を有し、とくに限定されるものではない。例えば金属としてA<sub>2</sub>、C<sub>2</sub>、Cu等があり、また合金としてはC<sub>2</sub>等がある。

高分子液晶層(4)は80～200nmを有し、サーモトロピック性を有する。例えばポリエステル共重合体、リカーボネート、ポリイソシアナート、タリオンエステル等のサーモ

明フィルム、例えばポリカーボネート、ポリエチレンテレフタレート、ポリエチレンメタクリレート等を積層してもよい。

カードの表面に反射層となる金属反射層(3)を既知の蒸着手段により形成し、金属反射層(3)上に高分子液晶層(4)となるサーモトロピック性高分子材料は、例えばグラビア印刷法、スクリーン印刷法、ノズルコーター法、ノズルコーター法等の既知の塗布手段により塗布する。通常に塗布した状態では、特定の結晶構造を有しないランダムな分子状態に形成されている。これに偏光フィルム(5)を第4図に示すように印字時のカードの進行方向(加熱加圧印字時の高分子液晶層の分子配向方向と同じ)に対して配向方向(6)が一定の角度 $\theta$  ( $0^\circ \sim 90^\circ$ )に合わせるとミネード等により積層し、表示部(7)を有するカード(1)が得られる。

表示部(7)は、外見上、画像を形成していない場合は表面の偏光フィルター固有の色相を呈しており、画像を形成した場合は偏光フィルターの中に多彩な色相を呈した画像が得られる。

る。

第3図は本発明のカードの層間、偏光フィルム(5)、高分子液晶層(4)、金属反射層(3)との間の光路の状態を概念的に説明した図である。このように光源(1)より偏光フィルム(5)を通して直線偏光となった白色反射光(2)が部分的に分子配向に異方性をもたせた高分子液晶層(4)を透過し、楕円偏光になり、金属蒸着層(3)により反射され、再度偏光フィルム(5)を通して透過反射光(6)が得られる。この透過反射光(6)は波長によって光の強さが異なるため、多彩な色相を有する画像が得られる。また、偏光フィルムの配向方向と分子配向された高分子液晶層との角度により、また異なる色相が得られる。

表示部(7)はカード全面あるいは所面に、いはカード内に嵌合して設け次に本発明の画像形成方法この表示部(7)に対しサーマル的に加熱加圧印字手段によるサーモトロピック性高分子に液晶性を示し、さらにサーマル的に一定方向に力が加わる部分に一定方向の配向が生ずるこのサーマルヘッドにより任意の画像パターンを描くことが可能上記の表示部(7)を有するカード(1)をサーマルヘッドの間に通し、サーマルヘッドに所定の文字・絵柄等画するように加熱加圧印字すると印字方向に、即ちカードの進んだ部分の高分子液晶層(4)に示部(7)に文字・絵柄等の画像

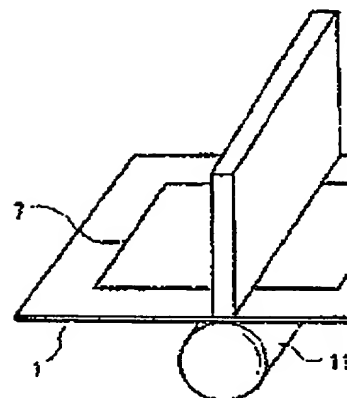
カードは画像の形成前はガラスの大量の生産により、製造が可能となり、カードの少量的に識別可能な、所謂IDカード多種発行することができる。＜発明の効果＞

以上述べたように、本発明は高分子液晶層により視覚的な通常の製造手段、例えば印刷は困難で、かつ視覚による特異な、真偽の判定が極めて容易なカードの発行も少量であることが出来る効果がある。

- (1) . . . カード
- (2) . . . カード基材
- (3) . . . 金属反射層
- (4) . . . 高分子液晶層
- (5) . . . 偏光フィルム
- (6) . . . 保護層
- (7) . . . 表示層
- (8) . . . 白色照射光
- (9) . . . 透過反射光
- (10) . . . サーマルヘッド
- (11) . . . 圧力ローラー
- (12) . . . 印字時のカードの進行方向
- (13) . . . 偏光フィルムの配向方向
- (14) . . . 光源

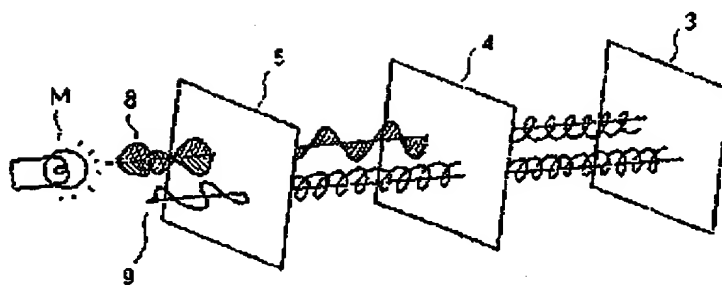


第 1 図

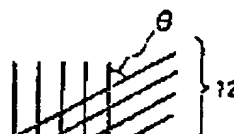


第 2 図

特 許 出 願 人  
凸 版 印 刷 株 式 会 社  
代 表 者 鈴 木 和 夫



第 3 図



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(71)Applicant : NHK SPRING CO LTD

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(72)Inventor : HOSHINO SHUICHI

TAKEUCHI ITSUO

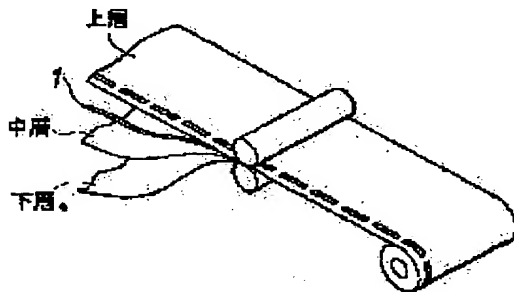
SHIBUYA KIYONARI

## (54) DISCRIMINATIVE STRUCTURE OF PAPERY OBJECT AND METHOD FOR DISCRIMINATION

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a discriminative structure being very hard to forge, having high discriminative properties and being suitable for papery articles circulating generally, and a method for discrimination.

SOLUTION: A discriminative medium having a macromolecular cholesteric liquid crystal film 1 is integrated with a papery object when this is manufactured. Thereby the discrimination making use of the characteristics of polarization by a cholesteric liquid crystal is made easily available and the discriminative properties are improved. Since the object and the discriminative medium are integrated, besides, an unfair practice of peeling off the discriminative medium from the object and sticking it to another object can be prevented. Moreover, the discriminative properties are further improved by providing a polarizing plate and a wave plate in this sequence from the incident light source side, as occasion demands, in an optical path through which an incident light on the discriminative medium and an emission light therefrom pass and by confirming the emission light visually or by a detecting device.



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**CLAIMS**

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[Claim(s)]

[Claim 1] it is \*\*\*\*\* at said object about the discernment medium which has a macromolecule cholesteric-liquid-crystal film in order to recognize a paper-like object optically and to identify the bona fides of this object -- the discernment structure of the object characterized by things.

[Claim 2] Discernment structure of the object according to claim 1 characterized by forming a polarizing plate and a quarter-wave length plate from the source side of incident light at this sequence into the optical path which the incident light of said discernment medium and its reflected light pass, and identifying said object for said reflected light viewing or by recognizing mechanically.

[Claim 3] Discernment structure of the object according to claim 1 or 2 characterized by said discernment medium consisting of a hologram which prepared macromolecule cholesteric liquid crystal in the reflecting layer.

[Claim 4] The discernment approach of the object characterized by identifying the bona fides of said object by irradiating light through a polarizing plate and a quarter-wave length plate from the external light source, receiving light with a light-receiving means to the discernment medium which has \*\*\*\*\* rare \*\*\*\*\* cholesteric liquid crystal in an object, or viewing the reflected light through said wavelength plate and polarizing plate to it, and recognizing said discernment medium.

[Claim 5] The discernment approach of the object characterized by identifying the bona fides of said object by recognizing a pattern that said discernment medium consisted of a hologram which prepared macromolecule cholesteric liquid crystal in the reflecting layer, and received light with the light-receiving means, or viewed said reflected light through said wavelength plate and polarizing plate, and it was recorded on said hologram, or an image. The discernment approach of the object according to claim 4 characterized by things.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates the discernment medium formed especially in the object to the structure and the approach for identifying the bona fides viewing or by recognizing mechanically about the discernment structure and the discernment approach for identifying bona fides for the purpose of forged prevention of the object of the shape of paper, such as a passport, a card, a bond, a gift certificate, pictures, a ticket, and a public game vote ticket.

[0002]

[Description of the Prior Art] as the forged prevention approach of the former, for example, a card, and bonds -- the front face of the object -- a hologram -- sticking -- this -- viewing -- or what identifies mechanically and judges the bona fides was common. moreover, it is \*\*\*\*\* about this hologram at the time of paper manufacture -- a thread hologram is one of things. This is used for the gift certificate, the bill, etc.

[0003]

[Problem(s) to be Solved by the Invention] However, with the spread of hologram manufacturing technologies in recent years, manufacture of a hologram becomes easy and a duplicate (forgery) article to the extent that a Shinsei thing and distinction do not attach especially the hologram for viewing is manufactured comparatively easily. Therefore, it cannot be denied that the forged prevention effectiveness by the hologram is low. moreover, other forged prevention techniques are expensive -- etc. -- there were few things suitable for the thing of the shape of paper which the article which generally circulates especially a gift certificate, a ticket, etc. are cheap, and also has low counts of a negotiation, and development of a new forged prevention technique was desired.

[0004] This invention is thought out so that it may solve the trouble of the conventional technique which was described above, and forgery is very difficult and it aims at offering the discernment structure and the discernment approach of the object suitable for the paper-like article with which epicritic [ the ] circulates highly and generally.

[0005]

[Means for Solving the Problem] So that according to this invention the above-mentioned object may recognize a paper-like object optically and may identify the bona fides of this object it is \*\*\*\*\* at said object about the discernment medium which has a macromolecule cholesteric-liquid-crystal film -- things in the optical path which the incident light of the discernment structure of the object by which it is characterized, or said discernment medium, and its reflected light pass To the discernment medium which has \*\*\*\*\* rare \*\*\*\*\* cholesteric liquid crystal in the discernment structure of an object and the object which are characterized by forming a polarizing plate and a quarter-wave length plate in this sequence from the source side of incident light, and identifying said object for said reflected light viewing or by recognizing mechanically Irradiate light through a polarizing plate and a quarter-wave length plate from the external light source, and the reflected light is received with a light-receiving means through said wavelength plate and polarizing plate. Or it is attained by viewing and recognizing

said discernment medium by offering the discernment approach of the object characterized by identifying the bona fides of said object.

[0006] Generally, the layer structure is made, and the direction of a molecule major axis of cholesteric liquid crystal in each class is mutually parallel, and is parallel to a stratification plane. Moreover, each class rotated little by little, has lapped, and takes spiral structure in three dimensions. It has the description selectively reflected to the circular polarization of light of wavelength  $\lambda$  expressed with  $\lambda = n \cdot p$  from distance, i.e., a pitch  $p$  and the average refractive index  $n$  in each class, until 360 degrees of this direction factor rotate and it returns to origin. Therefore, to incident light, the left-handed circularly-polarized light of the component of the above-mentioned wavelength  $\lambda$  will be reflected, and the direction of the liquid crystal of above-mentioned each class will penetrate the right-handed circularly polarized light, if it is left-handed rotation. Moreover, all of the light of other wavelength penetrate. For example, since all the transmitted lights will be absorbed and only the left-handed circularly-polarized light of wavelength  $\lambda_R$  will be reflected if the cholesteric liquid crystal which reflects red wavelength  $\lambda_R$  is arranged and random light, such as sunlight, is applied on the ingredient like the black paper which absorbs the light, cholesteric liquid crystal is visible to vivid red.

[0007] Moreover, cholesteric liquid crystal has the description that a color changes with the include angle to see. If this sets the angle of incidence over a liquid crystal side to  $\theta$ , the optical path difference reflected between the front face of this liquid crystal and Base  $p$ , i.e., a pitch, will be set to  $2p \cos(\theta)$ . this optical path difference -- the integral multiple of wavelength  $\lambda$  -- equal -- becoming  $(2p \cos \theta = n \lambda : n \text{ being an integer})$  -- both reflected light overlaps and suits in slight strength. Therefore, the wavelength which suits in slight strength is short as an incident angle becomes shallow, namely, it changes from red to blue.

[0008] On the other hand, generally, the hologram shaping layer is the diffraction grating of a \*\*\*\* pitch variously, and the metallic reflective layer attaches the hologram to the front face. Since the include angles diffracted with that pitch differ, how for it to be visible with an include angle differs, or the light reflected on this front face changes a color, or looks three-dimensional. By forming the reflecting layer of a hologram with cholesteric liquid crystal, it can also raise epicritic in multiplication using both optical property.

[0009]

[Embodiment of the Invention] Below, the suitable operation gestalt of this invention is explained.

[0010] the macromolecule cholesteric-liquid-crystal film 1 with which this invention was applied as shown in drawing 1 -- for example, the proper place of the paper-like objects A, such as a card, a passport, an instrument, and a gift certificate, -- one or or more two \*\*\*\*\* -- it prepares in one by things.

[0011] Thus, the liquid crystal film 1 prepared in the object will be read with viewing or a machine, and will be recognized.

[0012] Cholesteric liquid crystal reflects only the circular polarization of light (for example, right-handed circularly polarized light) of the one direction of specific wavelength (for example, green ( $\lambda_1$ )), and the light of other wavelength and the circular polarization of light (left-handed circularly-polarized light) of the other directions of  $\lambda_1$  are made to penetrate as it is here. the film 1 which consists of this cholesteric liquid crystal -- Object A -- \*\*\*\*\* -- when it sees from a specific include angle, only the part of the reflected light which has the liquid crystal film 1 among the light from the light source (for example, natural light) will be visible to  $\lambda_1$  (green) color with things. It is not necessary to say and color change of the reflected light according the usual film with a color to close outgoing radiation angle change of light at \*\*\*\*\* is not obtained.

[0013] Therefore, although the design of objects (gift certificate etc.) can be seen as it is with the usually almost transparent foil, if an include angle is changed, the Shinsei \*\* can be checked by viewing because the pattern of  $\lambda_1$  color is in sight.

[0014] What is necessary is here, to prepare the slit in that upper layer beforehand among the papers of a three-tiered structure, to insert this liquid crystal film 1 into band-like between a middle lamella and the

upper layer, as shown in \*\*\*\*\* at drawing 2 , and just to stick both layers by sticking by pressure etc., when the liquid crystal film 1 is made band-like.

[0015] On the other hand, as shown in drawing 3 , polarizing plate 2b and quarter-wave length plate 3b which arrange as a filter polarizing plate 2a and quarter-wave length plate 3a which let only the right-handed circularly polarized light pass, and adjoin this, and let only the left-handed circularly-polarized light pass in the optical path of the close outgoing radiation light of the liquid crystal film 1 may be arranged as a filter, in order to improve the accuracy of a bona-fides judging as another operation gestalt of this invention. The light which went into the polarizing plate 2 from the light source a side as by arranging these in the above-mentioned hologram foil 1 showed to drawing 4 turns into the right-handed circularly polarized light by this polarizing plate 2a and quarter-wave length plate 3a, and it goes into the liquid crystal film 1, is reflected by cholesteric liquid crystal, and becomes the original linearly polarized light by quarter-wave length plate 3a again, outgoing radiation is carried out through polarizing plate 2a, and it looks brightly from the outside. Moreover, by this polarizing plate 2b and quarter-wave length plate 3b, the light which went into the polarizing plate 2b side from the light source turns into the left-handed circularly-polarized light, goes into the liquid crystal film 1, penetrates cholesteric liquid crystal, and looks dark from the outside. A still clearer image is obtained by checking this by looking from a specific include angle.

[0016] Here, echoes of the circular polarization of light differ with a usual field and cholesteric liquid crystal, such as a mirror. Although right polarization reflects in respect of usual and it becomes left polarization, cholesteric liquid crystal will become the same right-handed circularly polarized light, if right polarization reflects. Even if it forges the film which follows, for example, reflects the same color as cholesteric liquid crystal, it is cut by polarizing plate 2a, and the difference of contrast does not come out.

[0017] In addition, as shown in drawing 5 , the reflected light of a \*\*\*\* lump and both may be viewed as a liquid crystal film 1 at paper through direct or a polarizing plate, and a quarter-wave length plate for band-like liquid crystal film 1a which reflects only the left-handed circularly-polarized light, and band-like liquid crystal film 1b which reflects only the right-handed circularly polarized light to juxtaposition. In that case, one band is bright and it is not necessary to say that the band of another side looks dark.

[0018] On the other hand, judgment equipment may be made to perform an automatic judging as still more nearly another operation gestalt of this invention. As shown in drawing 6 , the photo detectors 12, such as a photodiode, are formed into the optical path of the reflected light by the light source 11 and the liquid crystal films 1, such as an LED component, and the same polarizing plate 13 as the above and the quarter-wave length plate 14 are respectively formed in the front face of the light source 11 and a photo detector 12. And what is necessary is just to distinguish the bona fides of a discernment medium with the electric signal according to the light-receiving reinforcement of a photo detector 12.

[0019] It is good to use the liquid crystal film 1 as the liquid crystal which reflects infrared radiation here, and to generate infrared laser for the light source 11. Since infrared light does not reflect the light, since it is transparent, visually, the constraint on a design is eased. Moreover, in the case where a bright film is used simply, even if there are few echoes of infrared radiation and it uses a film with much reflective effectiveness, since the reflected light is changed into incident light and the reverse circular polarization of light and it is cut with a quarter-wave length plate and a polarizing plate as described above, the forged prevention effectiveness will become high.

[0020] As still more nearly another operation gestalt of this invention, the hologram foil 21 which used cholesteric liquid crystal as a reflecting layer may be used as a discernment medium, and \*\*\*\*\* is sufficient like the above of this at the paper-like object A. As shown in drawing 7 , the hologram foil 21 carries out the laminating of the glue line 22 to the middle lamella of Object A, the macromolecule cholesteric-liquid-crystal layer 23 as a reflecting layer, the hologram formative layer 24, and the protective layer 25, and this protective layer 25 commits it as a glue line to the upper layer. Thus, the hologram foil 21 formed in the object will be read with viewing or a machine, and will be recognized.

[0021] If it sets, the light for which patterns, such as an alphabetic character, were recorded as a hologram and which irradiated the hologram foil 21 from the light source (for example, fluorescent

lamp) diffracts, and the pattern will look actual to  $\lambda_1$  (green) color when it sees from a specific include angle. Those bona fides can be judged according to this phenomenon. Moreover, the light diffracted in the cholesteric-liquid-crystal layer 23 is a few, for example, if a pattern is in the middle lamella under the hologram foil 21, only the pattern is usually in sight as it is. That is, the hologram foil 21 is usually almost transparent.

[0022] Polarizing plate 2a and quarter-wave length plate 3a which let only the right-handed circularly polarized light pass in the optical path of the close outgoing radiation light of the hologram foil 21 are arranged as a filter like drawing 3 here. Moreover, if polarizing plate 2b and quarter-wave length plate 3b which adjoin this and let only the left-handed circularly-polarized light pass are arranged as a filter, by the polarizing plate 2a side, a hologram image looks [ show / in drawing 8 ] clear, and in a polarizing plate 2b side, a hologram image will not look almost but it will become dark. The bona fides of a discernment medium can be distinguished by checking this by looking from a specific include angle.

[0023] In addition, if the photo detector 26 which has many light sensing portions 26a-26h which consist of a photodiode by which hyperfractionation was carried out is arranged so that the perimeter of the light source 27 may be surrounded and the bona fides of the hologram foil 21 as a discernment medium are distinguished with the light-receiving reinforcement of the specific light sensing portion (for example, 26c, 26g) corresponding to the hologram image by the hologram foil 1 as shown in drawing 9 (a) and drawing 9 (b), epicritic [ the ] will improve. It is not necessary to say forming the same polarizing plate as the above, and a quarter-wave length plate (not shown) in the front face of the light source 27 and a photo detector 26 also in this case.

[0024] Although each above-mentioned operation gestalt explained the reflected wave length of cholesteric liquid crystal as a light of wavelength  $\lambda_1$  (green) color, the light of other wavelength is sufficient.

[0025]

[Effect of the Invention] the discernment medium which has macromolecule cholesteric liquid crystal by the above-mentioned explanation according to the discernment structure and the discernment approach of an object by this invention so that clearly -- a paper-like object -- \*\*\*\*\* -- by things, discernment using the property of the polarization by cholesteric liquid crystal becomes possible easily, and epicritic improves. Moreover, since the object and the discernment medium are unifying, the malfeasance which removes a discernment medium from an object and sticks it on other objects can also be prevented. furthermore, the inside of the optical path which the incident light and outgoing radiation light to a discernment medium pass -- the need -- responding -- the source side of incident light to a polarizing plate and a wavelength plate -- this sequence -- preparing -- outgoing radiation light -- viewing -- or epicritic improves further by checking with detection equipment. Moreover, since this discernment medium can be made transparent, it does not usually almost check the design degree of freedom on the front face of an object in using only the specific polarization component of the specific wavelength of incident light for discernment to a visible region. Furthermore, since two or more discernment approaches (for example, only viewing polarizing plate and wavelength plate + viewing, machine reading, etc.) are possible, it becomes discriminable according to an application and cost, and the versatility is also high.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates the discernment medium formed especially in the object to the structure and the approach for identifying the bona fides viewing or by recognizing mechanically about the discernment structure and the discernment approach for identifying bona fides for the purpose of forged prevention of the object of the shape of paper, such as a passport, a card, a bond, a gift certificate, pictures, a ticket, and a public game vote ticket.

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**PRIOR ART**

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[Description of the Prior Art] as the forged prevention approach of the former, for example, a card, and bonds -- the front face of the object -- a hologram -- sticking -- this -- viewing -- or what identifies mechanically and judges the bona fides was common. moreover, it is \*\*\*\*\* about this hologram at the time of paper manufacture -- a thread hologram is one of things. This is used for the gift certificate, the bill, etc.

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EFFECT OF THE INVENTION

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[Effect of the Invention] the discernment medium which has macromolecule cholesteric liquid crystal by the above-mentioned explanation according to the discernment structure and the discernment approach of an object by this invention so that clearly -- a paper-like object -- \*\*\*\*\* -- by things, discernment using the property of the polarization by cholesteric liquid crystal becomes possible easily, and epicritic improves. Moreover, since the object and the discernment medium are unifying, the malfeasance which removes a discernment medium from an object and sticks it on other objects can also be prevented. furthermore, the inside of the optical path which the incident light and outgoing radiation light to a discernment medium pass -- the need -- responding -- the source side of incident light to a polarizing plate and a wavelength plate -- this sequence -- preparing -- outgoing radiation light -- viewing -- or epicritic improves further by checking with detection equipment. Moreover, since this discernment medium can be made transparent, it does not usually almost check the design degree of freedom on the front face of an object in using only the specific polarization component of the specific wavelength of incident light for discernment to a visible region. Furthermore, since two or more discernment approaches (for example, only viewing polarizing plate and wavelength plate + viewing, machine reading, etc.) are possible, it becomes discriminable according to an application and cost, and the versatility is also high.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, with the spread of hologram manufacturing technologies in recent years, manufacture of a hologram becomes easy and a duplicate (forgery) article to the extent that a Shinsei thing and distinction do not attach especially the hologram for viewing is manufactured comparatively easily. Therefore, it cannot be denied that the forged prevention effectiveness by the hologram is low. moreover, other forged prevention techniques are expensive -- etc. -- there were few things suitable for the thing of the shape of paper which the article which generally circulates especially a gift certificate, a ticket, etc. are cheap, and also has low counts of a negotiation, and development of a new forged prevention technique was desired.

[0004] This invention is thought out so that it may solve the trouble of the conventional technique which was described above, and forgery is very difficult and it aims at offering the discernment structure and the discernment approach of the object suitable for the paper-like article with which epicritic [ the ] circulates highly and generally.

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MEANS

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[Means for Solving the Problem] So that according to this invention the above-mentioned object may recognize a paper-like object optically and may identify the bona fides of this object it is \*\*\*\*\* at said object about the discernment medium which has a macromolecule cholesteric-liquid-crystal film -- things in the optical path which the incident light of the discernment structure of the object by which it is characterized, or said discernment medium, and its reflected light pass To the discernment medium which has \*\*\*\*\* rare \*\*\*\*\* cholesteric liquid crystal in the discernment structure of an object and the object which are characterized by forming a polarizing plate and a quarter-wave length plate in this sequence from the source side of incident light, and identifying said object for said reflected light viewing or by recognizing mechanically Irradiate light through a polarizing plate and a quarter-wave length plate from the external light source, and the reflected light is received with a light-receiving means through said wavelength plate and polarizing plate. Or it is attained by viewing and recognizing said discernment medium by offering the discernment approach of the object characterized by identifying the bona fides of said object.

[0006] Generally, the layer structure is made, and the direction of a molecule major axis of cholesteric liquid crystal in each class is mutually parallel, and is parallel to a stratification plane. Moreover, each class rotated little by little, has lapped, and takes spiral structure in three dimensions. It has the description selectively reflected to the circular polarization of light of wavelength  $\lambda$  expressed with  $\lambda = n \cdot p$  from distance, i.e., a pitch  $p$  and the average refractive index  $n$  in each class, until 360 degrees of this direction factor rotate and it returns to origin. Therefore, to incident light, the left-handed circularly-polarized light of the component of the above-mentioned wavelength  $\lambda$  will be reflected, and the direction of the liquid crystal of above-mentioned each class will penetrate the right-handed circularly polarized light, if it is left-handed rotation. Moreover, all of the light of other wavelength penetrate. For example, since all the transmitted lights will be absorbed and only the left-handed circularly-polarized light of wavelength  $\lambda_R$  will be reflected if the cholesteric liquid crystal which reflects red wavelength  $\lambda_R$  is arranged and random light, such as sunlight, is applied on the ingredient like the black paper which absorbs the light, cholesteric liquid crystal is visible to vivid red.

[0007] Moreover, cholesteric liquid crystal has the description that a color changes with the include angle to see. If this sets the angle of incidence over a liquid crystal side to  $\theta$ , the optical path difference reflected between the front face of this liquid crystal and Base  $p$ , i.e., a pitch, will be set to  $2p \cos(\theta)$ . this optical path difference -- the integral multiple of wavelength  $\lambda$  -- equal -- becoming  $(2p \cos \theta = n \lambda, n \text{ being an integer})$  -- both reflected light overlaps and suits in slight strength. Therefore, the wavelength which suits in slight strength is short as an incident angle becomes shallow, namely, it changes from red to blue.

[0008] On the other hand, generally, the hologram shaping layer is the diffraction grating of a \*\*\*\* pitch variously, and the metallic reflective layer attaches the hologram to the front face. Since the include angles diffracted with that pitch differ, how for it to be visible with an include angle differs, or the light reflected on this front face changes a color, or looks three-dimensional. By forming the reflecting layer

of a hologram with cholesteric liquid crystal, it can also raise epirritic in multiplication using both optical property.

[0009]

[Embodiment of the Invention] Below, the suitable operation gestalt of this invention is explained.

[0010] the macromolecule cholesteric-liquid-crystal film 1 with which this invention was applied as shown in drawing 1 -- for example, the proper place of the paper-like objects A, such as a card, a passport, an instrument, and a gift certificate, -- one or more two \*\*\*\*\* -- it prepares in one by things.

[0011] Thus, the liquid crystal film 1 prepared in the object will be read with viewing or a machine, and will be recognized.

[0012] Cholesteric liquid crystal reflects only the circular polarization of light (for example, right-handed circularly polarized light) of the one direction of specific wavelength (for example, green ( $\lambda_1$ )), and the light of other wavelength and the circular polarization of light (left-handed circularly-polarized light) of the other directions of  $\lambda_1$  are made to penetrate as it is here. the film 1 which consists of this cholesteric liquid crystal -- Object A -- \*\*\*\*\* -- when it sees from a specific include angle, only the part of the reflected light which has the liquid crystal film 1 among the light from the light source (for example, natural light) will be visible to  $\lambda_1$  (green) color with things. It is not necessary to say and color change of the reflected light according the usual film with a color to close outgoing radiation angle change of light at \*\*\*\*\* is not obtained.

[0013] Therefore, although the design of objects (gift certificate etc.) can be seen as it is with the usually almost transparent foil, if an include angle is changed, the Shinsei \*\* can be checked by viewing because the pattern of  $\lambda_1$  color is in sight.

[0014] What is necessary is here, to prepare the slit in that upper layer beforehand among the papers of a three-tiered structure, to insert this liquid crystal film 1 into band-like between a middle lamella and the upper layer, as shown in \*\*\*\*\* at drawing 2, and just to stick both layers by sticking by pressure etc., when the liquid crystal film 1 is made band-like.

[0015] On the other hand, as shown in drawing 3, polarizing plate 2b and quarter-wave length plate 3b which arrange as a filter polarizing plate 2a and quarter-wave length plate 3a which let only the right-handed circularly polarized light pass, and adjoin this, and let only the left-handed circularly-polarized light pass in the optical path of the close outgoing radiation light of the liquid crystal film 1 may be arranged as a filter, in order to improve the accuracy of a bona-fides judging as another operation gestalt of this invention. The light which went into the polarizing plate 2 from the light source a side as by arranging these in the above-mentioned hologram foil 1 showed to drawing 4 turns into the right-handed circularly polarized light by this polarizing plate 2a and quarter-wave length plate 3a, and it goes into the liquid crystal film 1, is reflected by cholesteric liquid crystal, and becomes the original linearly polarized light by quarter-wave length plate 3a again, outgoing radiation is carried out through polarizing plate 2a, and it looks brightly from the outside. Moreover, by this polarizing plate 2b and quarter-wave length plate 3b, the light which went into the polarizing plate 2b side from the light source turns into the left-handed circularly-polarized light, goes into the liquid crystal film 1, penetrates cholesteric liquid crystal, and looks dark from the outside. A still clearer image is obtained by checking this by looking from a specific include angle.

[0016] Here, echoes of the circular polarization of light differ with a usual field and cholesteric liquid crystal, such as a mirror. Although right polarization reflects in respect of usual and it becomes left polarization, cholesteric liquid crystal will become the same right-handed circularly polarized light, if right polarization reflects. Even if it forges the film which follows, for example, reflects the same color as cholesteric liquid crystal, it is cut by polarizing plate 2a, and the difference of contrast does not come out.

[0017] In addition, as shown in drawing 5, the reflected light of a \*\*\*\* lump and both may be viewed as a liquid crystal film 1 at paper through direct or a polarizing plate, and a quarter-wave length plate for band-like liquid crystal film 1a which reflects only the left-handed circularly-polarized light, and band-like liquid crystal film 1b which reflects only the right-handed circularly polarized light to juxtaposition.

In that case, one band is bright and it is not necessary to say that the band of another side looks dark. [0018] On the other hand, judgment equipment may be made to perform an automatic judging as still more nearly another operation gestalt of this invention. As shown in drawing 6, the photo detectors 12, such as a photodiode, are formed into the optical path of the reflected light by the light source 11 and the liquid crystal films 1, such as an LED component, and the same polarizing plate 13 as the above and the quarter-wave length plate 14 are respectively formed in the front face of the light source 11 and a photo detector 12. And what is necessary is just to distinguish the bona fides of a discernment medium with the electric signal according to the light-receiving reinforcement of a photo detector 12.

[0019] It is good to use the liquid crystal film 1 as the liquid crystal which reflects infrared radiation here, and to generate infrared laser for the light source 11. Since infrared light does not reflect the light, since it is transparent, visually, the constraint on a design is eased. Moreover, in the case where a bright film is used simply, even if there are few echoes of infrared radiation and it uses a film with much reflective effectiveness, since the reflected light is changed into incident light and the reverse circular polarization of light and it is cut with a quarter-wave length plate and a polarizing plate as described above, the forged prevention effectiveness will become high.

[0020] As still more nearly another operation gestalt of this invention, the hologram foil 21 which used cholesteric liquid crystal as a reflecting layer may be used as a discernment medium, and \*\*\*\*\* is sufficient like the above of this at the paper-like object A. As shown in drawing 7, the hologram foil 21 carries out the laminating of the glue line 22 to the middle lamella of Object A, the macromolecule cholesteric-liquid-crystal layer 23 as a reflecting layer, the hologram formative layer 24, and the protective layer 25, and this protective layer 25 commits it as a glue line to the upper layer. Thus, the hologram foil 21 formed in the object will be read with viewing or a machine, and will be recognized.

[0021] If it sets, the light for which patterns, such as an alphabetic character, were recorded as a hologram and which irradiated the hologram foil 21 from the light source (for example, fluorescent lamp) diffracts, and the pattern will look actual to  $\lambda_1$  (green) color when it sees from a specific include angle. Those bona fides can be judged according to this phenomenon. Moreover, the light diffracted in the cholesteric-liquid-crystal layer 23 is a few, for example, if a pattern is in the middle lamella under the hologram foil 21, only the pattern is usually in sight as it is. That is, the hologram foil 21 is usually almost transparent.

[0022] Polarizing plate 2a and quarter-wave length plate 3a which let only the right-handed circularly polarized light pass in the optical path of the close outgoing radiation light of the hologram foil 21 are arranged as a filter like drawing 3 here. Moreover, if polarizing plate 2b and quarter-wave length plate 3b which adjoin this and let only the left-handed circularly-polarized light pass are arranged as a filter, by the polarizing plate 2a side, a hologram image looks [ show / in drawing 8 ] clear, and in a polarizing plate 2b side, a hologram image will not look almost but it will become dark. The bona fides of a discernment medium can be distinguished by checking this by looking from a specific include angle.

[0023] In addition, if the photo detector 26 which has many light sensing portions 26a-26h which consist of a photodiode by which hyperfractionation was carried out is arranged so that the perimeter of the light source 27 may be surrounded and the bona fides of the hologram foil 21 as a discernment medium are distinguished with the light-receiving reinforcement of the specific light sensing portion (for example, 26c, 26g) corresponding to the hologram image by the hologram foil 1 as shown in drawing 9 (a) and drawing 9 (b), epicritic [ the ] will improve. It is not necessary to say forming the same polarizing plate as the above, and a quarter-wave length plate (not shown) in the front face of the light source 27 and a photo detector 26 also in this case.

[0024] Although each above-mentioned operation gestalt explained the reflected wave length of cholesteric liquid crystal as a light of wavelength  $\lambda_1$  (green) color, the light of other wavelength is sufficient.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The top view showing one configuration of the discernment structure of the object based on this invention.

[Drawing 2] The perspective view showing briefly the production process of the object which has the discernment structure based on this invention.

[Drawing 3] The sectional view showing another configuration of the discernment structure of the object based on this invention.

[Drawing 4] The top view showing another configuration of the discernment structure of the object based on this invention.

[Drawing 5] The top view showing another configuration of the discernment structure of the object based on this invention.

[Drawing 6] The perspective view showing another configuration of the discernment structure of the object based on this invention.

[Drawing 7] The sectional view of the object in which another configuration of the discernment structure of the object based on this invention is shown.

[Drawing 8] The top view showing an operation of a configuration of being shown in drawing 7.

[Drawing 9] For (a), the sectional side elevation showing another configuration of the discernment structure of the object based on this invention and (b) are the light source of (a), and the top view of a photo detector.

[Description of Notations]

1 Liquid Crystal Film

1a The band-like liquid crystal film which reflects only the left-handed circularly-polarized light

1b The band-like liquid crystal film which reflects only the right-handed circularly polarized light

2a, 2b Polarizing plate

3a, 3b Quarter-wave length plate

11 Light Source

12 Photo Detector

13 Polarizing Plate

14 Quarter-wave Length Plate

21 Hologram Foil

22 Glue Line

23 Macromolecule Cholesteric-Liquid-Crystal Layer (Reflecting Layer)

24 Hologram Formative Layer

25 Protective Layer

26 Photo Detector

26a-26h Light sensing portion

27 Light Source

A Object

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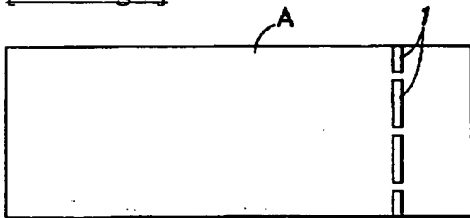
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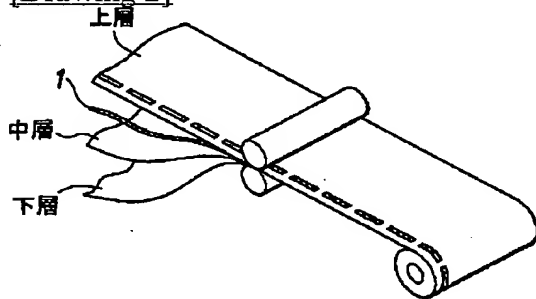
DRAWINGS

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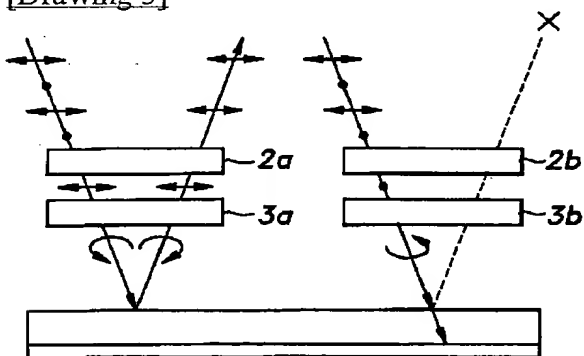
[Drawing 1]



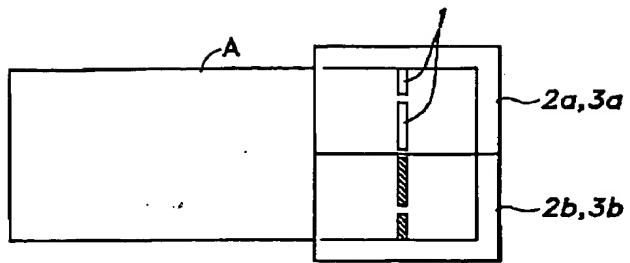
[Drawing 2]



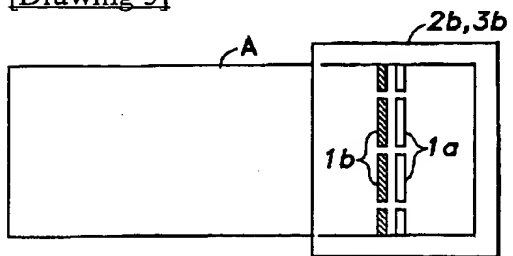
[Drawing 3]



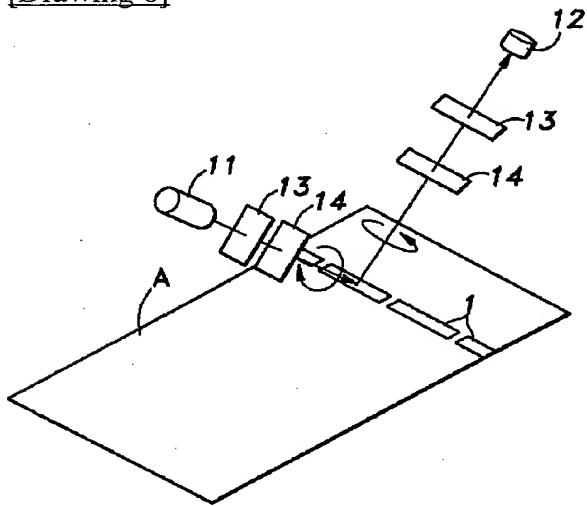
[Drawing 4]



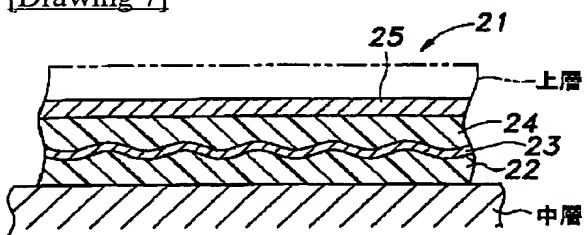
[Drawing 5]



[Drawing 6]

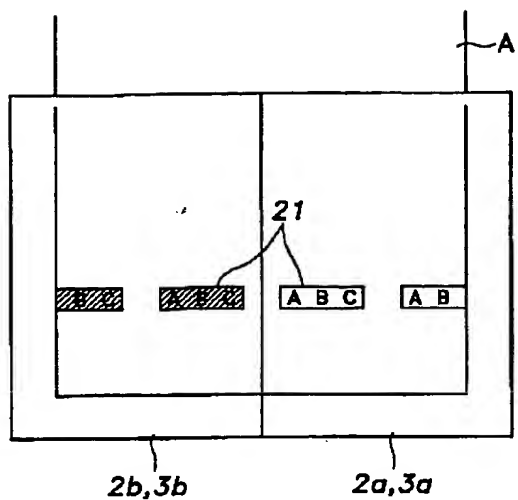


[Drawing 7]

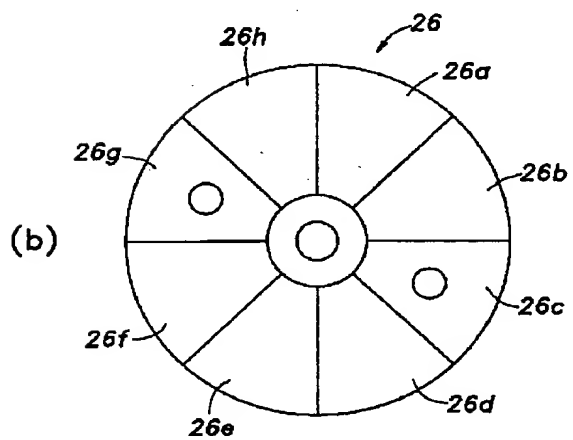
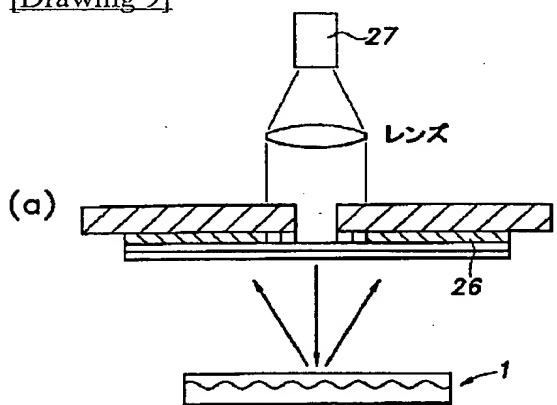


[Drawing 8]





[Drawing 9]



[Translation done.]